

CLAIMS:

1. (currently amended) A decoding process comprising:

receiving a block of coefficients relating to a block of video information to be displayed which has been transformed and quantized for compression of the video information;

providing a single look-up table (LUT) which consists of a single group of scaling factors applicable for scaling of coefficients of different block sizes;

computing an index for each coefficient, the index being a function of a quantization parameter, a size of the block of coefficients, and a position of said each coefficient within the block;

indexing the LUT, using the computed index, to determine a scaling factor in the LUT applicable for scaling of said each coefficient, wherein indexing is independent of a size of the block;

scaling a the block of received coefficients, using the determined scaling factors, to inversely quantize the block of received coefficients that represents a block of information using a scaling factor determined for each coefficient by computing an index for said each coefficient and indexing a look-up table (LUT) using the index, wherein the index is based on a quantization parameter, a size of the block of coefficients, and a position of said each coefficient within the block; and

applying an inversely transform to the block of scaled coefficients in order to decode reconstruct a signal of the block of video information for display of the video signal;

wherein the LUT is used independently of the block size, such that the LUT supports the transform being for one of a plurality of block sizes.

2. (currently amended) The decoding process defined in Claim 1 wherein the index is the sum of a modulo from the quantization parameter and a first value determined by block size of the block of coefficients and the position of said each coefficient within the block.

3. (original) The decoding process defined in Claim 2 wherein the first value is the sum of a second value determined by the vertical size of the block and the vertical position of said each

coefficient within the block and a third value determined by the horizontal size of the block and the horizontal position of said each coefficient within the block.

4. (original) The decoding process defined in Claim 3 wherein the block size is one selected from a group that consists of 4x4, 4x8, 8x4 and 8x8.

5. (canceled)

6. (original) The decoding process defined in Claim 1 further comprising:
determining an offset of an array according to the position of said each coefficient;
determining an inverse quantization value for said each coefficient based on the offset.

7. (original) The decoding process defined in Claim 6 wherein entries of the array are of a form $\text{pow}(2, (k+O)/12)$, where k represents a position of an individual entry in the array and O is a constant.

8. (original) The decoding process defined in Claim 6 wherein the array is a 1-dimensional (1-D).

9. (currently amended) The decoding process defined in Claim 1 wherein ~~applying~~
an inversely transform to the block of scaled coefficients comprises:

applying a vertical transform to the block of scaled coefficients; and
applying a horizontal transform to block of scaled coefficients.

10. (currently amended) The decoding process defined in Claim 1 wherein the basis vectors of the transform are:

1	1	1	1	1	1	1	1
12/8	10/8	6/8	3/8	-3/8	-6/8	-10/8	-12/8
1	1/2	-1/2	-1	-1	-1/2	1/2	1
10/8	-3/8	-12/8	-6/8	6/8	12/8	3/8	-10/8
1	-1	-1	1	1	-1	-1	1
6/8	-12/8	3/8	10/8	-10/8	-3/8	12/8	-6/8
1/2	-1	1	-1/2	-1/2	1	-1	1/2
3/8	-6/8	10/8	-12/8	12/8	-10/8	6/8	-3/8

or multiples thereof or a transform thereof, and represent an 8-point transform used for blocks that have one or both of horizontal and vertical size of 8.

11. (currently amended) The decoding process defined in Claim 1 wherein ~~applying the inversely~~ transform ~~to~~ the block of scaled coefficients comprises computing ~~a the inverse~~ transform using only a sequence of addition, subtraction, and shift operations.

12. (original) The decoding process defined in Claim 1 wherein the block size is one selected from a group that consists of 4x4, 4x8, 8x4 and 8x8.

13. (currently Amended) A computer-implemented decoder for decoding a block of coefficients relating to a block of video information to be displayed which has been transformed and quantized for compression of the video information, the decoder comprising:

a memory which stores a single look-up table (LUT) which consists of a single group of scaling factors applicable for scaling of coefficients of different block sizes;

an index calculator configured to compute an index for each coefficient, the index being a function of a quantization parameter, a size of the block of coefficients, and a position of said each coefficient within the block;

an indexer configured to index the LUT, using the computed index, to determine a scaling factor in the LUT applicable for scaling of said each coefficient, wherein indexing is independent of a size of the block;

~~an inverse quantizer~~ a scaler configured to scale a the block of received coefficients, using the determined scaling factors, to inversely quantize the block of received coefficients that represents a block of information using a scaling factor determined for each coefficient by computing an index for said each coefficient and indexing the LUT using the index, wherein the index is based on a quantization parameter, a size of the block of coefficients, and a position of said each coefficient within the block; and

an inverse transformer unit configured to applying an inversely transform to the block of scaled coefficients in order to decode/reconstruct a signal of the block of video information for display of the video signal.

~~Wherein the LUT is used independently of the block size, such that LUT supports the transform being for one of a plurality of block sizes.~~

14. (currently amended) The decoder defined in Claim 13 wherein the index is the sum of a modulo from the quantization parameter and a first value determined by block size of the block of coefficients and the position of said each coefficient within the block.

15. (original) The decoder defined in Claim 14 wherein the first value is the sum of a second value determined by the vertical size of the block and the vertical position of said each coefficient within the block and a third value determined by the horizontal size of the block and the horizontal position of said each coefficient within the block.

16. (original) The decoder defined in Claim 15 wherein the block size is one selected from a group that consists of 4x4, 4x8, 8x4 and 8x8.

17. (canceled)

18. (currently amended) The decoder defined in Claim 13 wherein the ~~inverse quantizer~~scaler scales a the block of received coefficients using a scaling factor by
determining an offset of an array according to the position of said each coefficient;
determining an inverse quantization value for said each coefficient based on the offset.

19. (original) The decoder defined in Claim 18 wherein entries of the array are of a form $\text{pow}(2, (k+O)/12)$, where k represents a position of an individual entry in the array and O is a constant.

20. (original) The decoder defined in Claim 18 wherein the array is a 1-dimensional (1-D).

21. (currently amended) The decoder defined in Claim 13 wherein the inverse transformer
~~unit applies the transform to~~inversely transforms the block of scaled coefficients by
applying a vertical transform to the block of scaled coefficients; and
applying a horizontal transform to block of scaled coefficients.

22. (currently amended) The decoder defined in Claim 13 wherein the basis vectors of the inverse transform are:

1	1	1	1	1	1	1	1
12/8	10/8	6/8	3/8	-3/8	-6/8	-10/8	-12/8
1	1/2	-1/2	-1	-1	-1/2	1/2	1
10/8	-3/8	-12/8	-6/8	6/8	12/8	3/8	-10/8
1	-1	-1	1	1	-1	-1	1
6/8	-12/8	3/8	10/8	-10/8	-3/8	12/8	-6/8
1/2	-1	1	-1/2	-1/2	1	-1	1/2
3/8	-6/8	10/8	-12/8	12/8	-10/8	6/8	-3/8

or multiples thereof or a transform thereof, and represent an 8-point transform used for blocks that have one or both of horizontal and vertical size of 8.

23. (currently amended) The decoder defined in Claim 13 wherein the inverse transformer ~~unit~~ computes the inverse transform using only a sequence of addition, subtraction, and shift operations.

24. (original) The decoder defined in Claim 13 wherein the block size is one selected from a group that consists of 4x4, 4x8, 8x4 and 8x8.

25. (currently amended) ~~An article of manufacture comprising one or more~~ A computer-readable medium storing instructions which, when executed by a system, cause the system to:

receive a block of coefficients relating to a block of video information to be displayed which has been transformed and quantized for compression of the video information;

provide a single look-up table (LUT) which consists of a single group of scaling factors applicable for scaling of coefficients of different block sizes;

compute an index for each coefficient, the index being a function of a quantization parameter, a size of the block of coefficients, and a position of said each coefficient within the block;

index the LUT, using the computed index, to determine a scaling factor in the LUT applicable for scaling of said each coefficient, wherein indexing is independent of a size of the block;

~~scale a the block of received coefficients, using the determined scaling factors, to inversely quantize the block of received coefficients that represents a block of information using a scaling factor determined for each coefficient by computing an index for said each coefficient and indexing a look-up table (LUT). using the index, wherein the index is based on a quantization parameter, a size of the block of coefficients, and a position of said each coefficient within the block; and~~

~~apply an~~inversely transform to the block of scaled coefficients in order to decode reconstruct a signal of the block of video information for display of the video signal;

~~wherein the LUT is used independently of the block size, such that the LUT supports the transform being for one of a plurality of block sizes.~~

26. (currently amended) The ~~article of manufacture~~computer-readable medium defined in Claim 25 wherein the index is the sum of a modulo from the quantization parameter and a first value determined by block size of the block of coefficients and the position of said each coefficient within the block.

27. (currently amended) The ~~article of manufacture~~computer-readable medium defined in Claim 26 wherein the first value is the sum of a second value determined by the vertical size of the block and the vertical position of said each coefficient within the block and a third value determined by the horizontal size of the block and the horizontal position of said each coefficient within the block.

28. (currently amended) The ~~article of manufacture~~computer-readable medium defined in Claim 25 wherein the block size is one selected from a group that consists of 4x4, 4x8, 8x4 and 8x8.

29. (canceled)

30. (currently amended) A decoding apparatus for decoding a block of coefficients relating to a block of video information to be displayed which has been transformed and quantized for compression of the video information, decoding apparatus comprising:

means for storing a single look-up table (LUT) which consists of a single group of scaling factors selectively applicable for scaling of coefficients of different block sizes;

means for computing an index for each coefficient, the index being a function of a quantization parameter, a size of the block of coefficients, and a position of said each coefficient within the block;

means for indexing the LUT, using the computed index, to determine a scaling factor in the LUT applicable for scaling of said each coefficient, wherein indexing is independent of a size of the block;

means for scaling a the block of received coefficients, using the determined scaling factors, to inversely quantize the block of received coefficients~~that represents a block of information using a scaling factor determined for each coefficient by computing an index for said each coefficient and indexing a look-up table (LUT) using the index, wherein the index is based on a quantization parameter, a size of the block of coefficients, and a position of said each coefficient within the block; and~~

means for applying an inversely transforming to the block of scaled coefficients in order to decode/reconstruct a signal of the block of video information for display of the video signal.
~~wherein the LUT is used independently of the block size, such that the LUT supports the transform being for one of a plurality of block sizes.~~

31. (currently amended) A decoding process comprising:

receiving a block of coefficients relating to a block of video information to be displayed which has been transformed and quantized for compression of the video information;

providing a single look-up table (LUT) which consists of a group of scaling factors applicable for scaling of coefficients of different block sizes;

computing an index for each coefficient, the index being a function of a quantization parameter, a size of the block of coefficients, and a position of said each coefficient within the block;

indexing the LUT, using the computed index, to determine a scaling factor in the LUT applicable for scaling of said each coefficient, wherein indexing is independent of a size of the block;

scaling a the block of received coefficients, using the determined scaling factors, to inversely quantize the block of received coefficients that represents a block of information using a scaling factor determined for each coefficient by computing an index for said each coefficient and indexing a look-up table (LUT), using the index, wherein the index is based on a quantization parameter and a position of said each coefficient within the block; and

applying a vertical transform and a horizontal transform to the block of scaled coefficient, in order to decode-reconstruct a signal of the block of video information for display of the video signal, wherein basis vectors of the vertical and horizontal transforms are

1	1	1	1	1	1	1	1
12/8	10/8	6/8	3/8	-3/8	-6/8	-10/8	-12/8
1	1/2	-1/2	-1	-1	-1/2	1/2	1
10/8	-3/8	-12/8	-6/8	6/8	12/8	3/8	-10/8
1	-1	-1	1	1	-1	-1	1
6/8	-12/8	3/8	10/8	-10/8	-3/8	12/8	-6/8
1/2	-1	1	-1/2	-1/2	1	-1	1/2
3/8	-6/8	10/8	-12/8	12/8	-10/8	6/8	-3/8

or multiples thereof or a transform thereof; and

wherein the LUT is used independently of the block size, such that the LUT supports the transform being for one of a plurality of block sizes.

32. (currently amended) The decoding process defined in Claim 31 wherein the index is a sum of a modulo from the quantization parameter, a first value determined by a vertical position of said each coefficient within the block and a second value determined by a horizontal position of said each coefficient within the block.

33. (original) The decoding process defined in Claim 31 wherein applying the transform comprises computing the transform using only a sequence of addition, subtraction and shift operations.

34. (original) The decoding process defined in Claim 31 wherein the block size is one selected from a group that consists of 4x4, 4x8, 8x4 and 8x.8.

35-36. (cancel)

37. (currently amended) A computer-implemented decoder for decoding a block of coefficients relating to a block of video information to be displayed which has been transformed and quantized for compression of the video information, the decoder comprising:

a memory which stores a single look-up table (LUT) which consists of a group of scaling factors applicable for scaling of coefficients of different block sizes;

an index calculator configured to compute an index for each coefficient, the index being a function of a quantization parameter, a size of the block of coefficients, and a position of said each coefficient within the block;

an indexer configured to index the LUT, using the computed index, to determine a scaling factor in the LUT applicable for scaling of said each coefficient, wherein indexing is independent of a size of the block;

an inverse quantizerscaler configured to scale a-the block of received coefficients, using the determined scaling factors, to inversely quantize the block of received coefficients~~that represents a block of information using a scaling factor determined for each coefficient by computing an index for said each coefficient and indexing a look-up table (LUT) using the index, wherein the index is based on a quantization parameter and a position of said each coefficient within the block; and~~

an inverse transformer to apply a vertical transform and a horizontal transform to the block of scaled coefficients in order to decode-reconstruct a signal of the block of video information for display of the video signal, wherein basis vectors of the vertical and horizontal transforms are

1	1	1	1	1	1	1	1
12/8	10/8	6/8	3/8	-3/8	-6/8	-10/8	-12/8
1	1/2	-1/2	-1	-1	-1/2	1/2	1
10/8	-3/8	-12/8	-6/8	6/8	12/8	3/8	-10/8

1	-1	-1	1	1	-1	-1	1
6/8	-12/8	3/8	10/8	-10/8	-3/8	12/8	-6/8
1/2	-1	1	-1/2	-1/2	1	-1	1/2
3/8	-6/8	10/8	-12/8	12/8	-10/8	6/8	-3/8

or multiples thereof ~~or a transform thereof;~~ and
~~wherein the LUT is used independently of the block size, such that the LUT supports the transform being for one of a plurality of block sizes.~~

38. (currently amended) The decoder defined in Claim 37 wherein the index is a sum of a modulo from the quantization parameter, a first value determined by a vertical position of said each coefficient within the block and a second value determined by a horizontal position of said each coefficient within the block.

39. (original) The decoder defined in Claim 37 wherein applying the transform comprises computing the transform using only a sequence of addition, subtraction and shift operations.

40. (cancelled)

41. (currently amended) ~~An article of manufacture comprising one or more~~ A computer-readable medium storing instructions which, when executed by a system, cause the system to:
receive a block of coefficients relating to a block of video information to be displayed which has been transformed and quantized for compression of the video information;
provide a single look-up table (LUT) which consists of a single group of scaling factors applicable for scaling of coefficients of different block sizes;
compute an index for each coefficient, the index being a function of a quantization parameter, a size of the block of coefficients, and a position of said each coefficient within the block;
index the LUT, using the computed index, to determine a scaling factor in the LUT applicable for scaling of said each coefficient, wherein indexing is independent of a size of the block;

~~scale a~~ the block of received coefficients, using the determined scaling factors, to inversely quantize the block of received coefficients ~~that represents a block of information using a scaling factor determined for each coefficient by computing an index for said each coefficient and indexing a look-up table (LUT) using the index, wherein the index is based on a quantization parameter and a position of each coefficient within the block; and~~

apply a vertical transform and a horizontal transform to the block of scaled coefficients, in order to ~~decode~~ reconstruct a signal of the block of video information for display of the video signal, wherein basis vectors of the vertical and horizontal transforms are

1	1	1	1	1	1	1	1
12/8	10/8	6/8	3/8	-3/8	-6/8	-10/8	-12/8
1	1/2	-1/2	-1	-1	-1/2	1/2	1
10/8	-3/8	-12/8	-6/8	6/8	12/8	3/8	-10/8
1	-1	-1	1	1	-1	-1	1
6/8	-12/8	3/8	10/8	-10/8	-3/8	12/8	-6/8
1/2	-1	1	-1/2	-1/2	1	-1	1/2
3/8	-6/8	10/8	-12/8	12/8	-10/8	6/8	-3/8

or multiples thereof or a transform thereof; ~~and~~

~~wherein the LUT is used independently of the block size, such that the LUT supports the transform being for one of a plurality of block sizes.~~

42. (currently amended) The ~~article of manufacture~~ computer-readable medium defined in Claim 41 wherein the index is a sum of the quantization parameter, a first value determined by a vertical position of said each coefficient within the block and a second value determined by a horizontal position of said each coefficient within the block.

43. (currently amended) The ~~article of manufacture~~ computer-readable medium defined in Claim 41 wherein instructions to cause the system to apply the transform comprise instructions which, when executed by the system, cause the system to compute the transform using only a sequence of addition, subtraction and shift operations.

44. (cancelled)

45. (currently amended) A decoder for decoding a block of coefficients relating to a block of video information to be displayed which has been transformed and quantized for compression of the video information, decoder comprising:

means for storing a single look-up table (LUT) which consists of a single group of scaling factors selectively applicable for scaling of coefficients of different block sizes;

means for computing an index for each coefficient, the index being a function of a quantization parameter, a size of the block of coefficients, and a position of said each coefficient within the block;

means for indexing the LUT, using the computed index, to determine a scaling factor in the LUT applicable for scaling of said each coefficient, wherein indexing is independent of a size of the block;

means for scaling a block of coefficients, using the determined scaling factors, to inversely quantize the block of received coefficients~~that represents a block of information using a scaling factor determined for each coefficient by computing an index for said each coefficient and indexing a look-up table (LUT) using the index, wherein the index is based on a quantization parameter and a position of said each coefficient within the block;~~ and

means for applying a vertical transform and a horizontal transform to the block of scaled coefficients in order to ~~decode~~ reconstruct a signal of the block of video information for display of the video signal, wherein basis vectors of the vertical and horizontal transforms are

1	1	1	1	1	1	1	1
12/8	10/8	6/8	3/8	-3/8	-6/8	-10/8	-12/8
1	1/2	-1/2	-1	-1	-1/2	1/2	1
10/8	-3/8	-12/8	-6/8	6/8	12/8	3/8	-10/8
1	-1	-1	1	1	-1	-1	1
6/8	-12/8	3/8	10/8	-10/8	-3/8	12/8	-6/8
1/2	-1	1	-1/2	-1/2	1	-1	1/2
3/8	-6/8	10/8	-12/8	12/8	-10/8	6/8	-3/8

or multiples thereof or a transform thereof; and

wherein the LUT is used independently of the block size, such that the LUT supports the transform being for one of a plurality of block sizes.

46-64. (Canceled)